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# Personalized ordering for presentation of help topics

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## **Personalized ordering for presentation of help topics**

### **ABSTRACT**

Users often consult online help when they encounter problems. Many online help resources are organized as a list of question-answer pairs or topics presented in a fixed order. Upon user consent, the techniques of this disclosure utilize a machine learning model to personalize the order in which the list of question-answer pairs or topics is presented to the user. The personalized ordering utilizes the knowledge of the context of the user to sort the presented list of help content based on the match of the content with the problem the user is likely facing.

### **KEYWORDS**

- Online help
- FAQ
- Frequently asked questions
- Ordered list
- Personalization
- Machine learning

### **BACKGROUND**

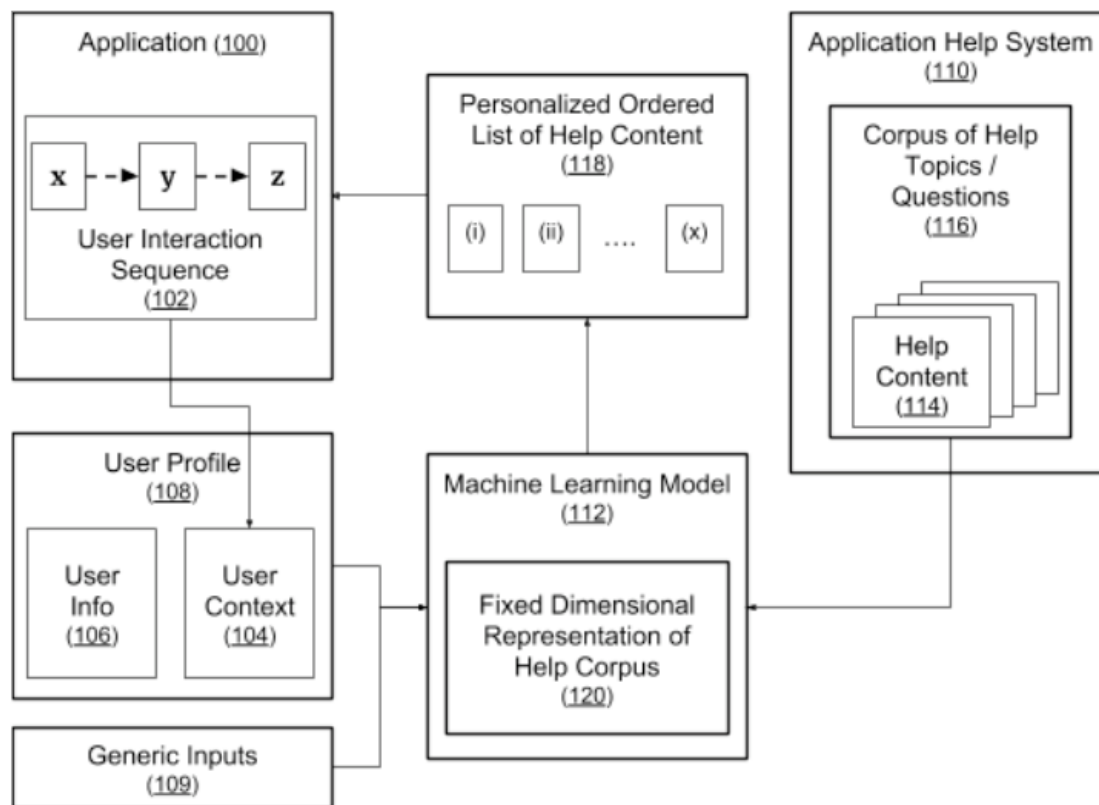
When users encounter problems, e.g., during the use of a software application, they often look for a solution by consulting such as a knowledge base or a support website. Many of these help resources are organized based on the topics or questions addressed by the content. All users that access such resources are presented with a list of the topics or questions (e.g., organized as question-answer pairs) organized in a fixed order. For instance, many help resources include answers to a list of Frequently Asked Questions (FAQ) wherein the questions are presented in a fixed order to all users. The lists may be further organized as multiple nested levels of fixed

ordered lists. The fixed ordering may be alphabetical or based on the decisions made by the creators of the help content regarding the optimal presentation order for all users. As a result of the fixed ordering, users that consult the help resource need to locate their specific concern within the list of topics or questions. This can require substantial reading and scrolling unless the problem that the user consults the list for happens to be among those that are presented at the top of the list.

### DESCRIPTION

Upon user consent, the techniques of this disclosure enable personalization of the order in which the list of questions or topics is presented to the user. The personalization is based on the context of the user, e.g., immediately prior to seeking help. The context is derived from examining the activity the user was performing or attempting to perform immediately before deciding to seek help. The examining is based on evaluation of factors that the user provides permission for.

Knowledge of the context of the user serves as an input to a machine learning model along with other inputs, such as other permitted user-specific characteristics, the time of the day at which help is sought, etc. Based on the inputs, a score is assigned to each piece of help content, such as a topic or a question, indicating the extent of the match with the problem the user is likely facing. Subsequently, the user is presented with a list of pieces of help content ranked by the match score. This can provide an improved likelihood that the content that addresses the user's problem is among the top items, and help reduce the amount of reading and scrolling required of the user.



**Fig. 1: Personalizing the order of presented help topics**

Fig. 1 shows an example implementation of the techniques of this disclosure. A user of an application (100) performs a series of interactive steps, e.g., user interaction sequence  $x \rightarrow y \rightarrow z$  (102) and runs into a problem. For example, the user of an email program may be unable to locate the button to archive an email after having read and replied to it. When permitted for use as contextual factors, the steps of the user's interaction with the application are utilized as the user context within the user profile (108). The user profile may additionally include other user-permitted characteristics (106), such as age, gender, technical expertise, etc.

To solve the encountered challenge, the user consults the help system (110) for the application, e.g., the email program. The help system may be provided within the application or as an externally hosted resource. The user's request for help is provided to a machine learning

model (112). With user consent, contents of the user profile that include the user's context of immediate previous interactive steps within the application, are provided as inputs to the machine learning model along with other generic inputs (109), such as the time of the day.

Based on the inputs, the machine learning model assigns a match score to different pieces of help content (114) within the entire help corpus (116). The match score indicates the extent to which it addresses the problem the user is likely facing. Subsequently, a list of pieces of help content (118), such as topics or questions (e.g., presented as question-answer pairs), ordered by the match scores is presented to the user. In some configurations, the machine learning model is applied to pre-process the help corpus to obtain a fixed dimensional representation (120) that can be used during the dynamic calculations of match scores.

The user's context as captured by the user's interaction with the application may cover recording a variety of user actions, such as cursor movements, click or taps, text highlighting, scrolling, and page visits. These actions along with corresponding timestamp, indicating the time at which the user engaged in the action, upon user permission for use in personalizing help provided, may be captured and stored in any format suitable for further processing.

For instance, a click or tap may be captured as an image screenshot of the application at the corresponding time or a timestamped list of page visits may be used to indicate the sequence in which the user visited pages within the application. The length of the sequence of captured user actions may be limited to include only a certain number of most recent actions, with the oldest action being deleted from the list with each new action that is inserted in the sequence. In such cases, the length can be set according to one or more factors, such as input size needed for optimal performance of the machine learning model, operational parameters specified by the user, user permissions, and capabilities and requirements of storage.

The fixed dimensional representation can be obtained using pre-trained word embeddings or other suitable models. Alternatively, if sufficient data is available, it may be trained end-to-end along with the other signals in the model. The techniques of the disclosure can utilize any suitable machine learning model, such as a multi-layer neural network or a recurrent neural network, to process the inputs and calculate the match score for the pieces of help content. The training data needed for implementing the techniques of this disclosure may be obtained, with user consent, by pairs composed of a set of user actions within the application and the help item that was deemed useful to address the issue encountered at the end of those actions. Training data is obtained with user permission for use of such data for training. The model may be trained jointly such that the help items in the training data are ranked in the first position. The approach may be applied to any list ranking system that needs to pick a single item among all available items. Once chosen, the item may be delivered via any suitable interface, such as text, image, or voice.

The techniques described above can be extended by providing the associated operational capabilities in the form of an Application Programming Interface (API) for inference and optionally, for training. For example, the API can enable application developers to include additional custom context signals as inputs and provide additional options for the pieces of help content, such as desired mapping and ranking that connects the pieces of help content to specific input conditions from user interactions in their application (signals that would otherwise be unavailable during normal training). The API can also facilitate utilization of the techniques of this disclosure in a generic manner across different applications, products, and operating systems. Moreover, by analyzing the user interactions with a help system augmented by the

techniques of this disclosure, software providers may be able to uncover the typical difficulties faced by their users.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

## CONCLUSION

Users often consult online help when they encounter problems. Many online help resources are organized as a list of question-answer pairs or topics presented in a fixed order. Upon user consent, the techniques of this disclosure utilize a machine learning model to personalize the order in which the list of question-answer pairs or topics is presented to the user. The personalized ordering utilizes the knowledge of the context of the user to sort the presented list of help content based on the match of the content with the problem the user is likely facing. The context is derived from examining the activity the user was performing or attempting to perform immediately before deciding to seek help. The personalized ordering increases the probability that the content that addresses the user's problem among the top items, thus reducing

the amount of reading and scrolling required of the user. The techniques may be extended by providing the associated operational capabilities in the form of an Application Programming Interface (API).